PROFIT LEVEL AND PRICE FIXING IN HAZELNUT PRODUCTION

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ABSTRACT

Hazelnut is conventional fruit being produced in black sea region of country having the highest production value and export volume in the world. It has been traditionally supported by governments through guarantee purchasing and thus has led hazelnut production and its stock to increase. Producers are making a typical cost that is consisting of fixed and variable costs. Rational producers are seeking income and profit maximization under current economic environment. This study clearly reveals that the country has experienced over production of this product. In this study, data belong to cost and income models collected by survey method. Hazelnut cost and income are linked with establishment information which is provided from 54 agricultural establishments through sampling method. These establishments were selected from density of hazelnut production. In this regard, different organizations have maintained different registers with regards to hazelnut related information. Demand is made by regres over income and price and this point income elasticity of demand and price elasticity of demand are found. $lnQ_d= 4.497+0.000003lnR_d–0.17lnP_d$ model is established by log-log models and later, it is found like this income elasticity of demand is 0.000003 and price elasticity of demand is -0.17. Getting empirical results are similar with economical theory. All of the costs details are collected from producers with face to face by survey method.

Key words: Profit level, price fixing, hazelnut, costs

INTRODUCTION

Hazelnut is a traditionally growing in the provinces of Turkey especially Ordu, Giresun, Trabzon, Artvin and Rize. Year in year out, warranted by goverments hazelnut has however much productivity (Anşin, 1980). Hazelnut spreads out in all provinces of central and west Black Regions which grow basic agricultural production. Hazelnut has a one year low and one year high production capacity with regard to change of climate.

World hazelnut production and export has been owned by Turkey, in 2008 Turkey has materialized almost 800.000 ton production and 1.5 million dollar export. Italy, Spain, Azerbaijan, USA, Iran and China follow Turkey's production. Germany is not hazelnut production country but reexport hazelnut and is an important hazelnut export country in the world (Turkish Investment Daily News Bulletin, 2009). According to Blacksea Exporters' Union's (BEU) register, in Turkey there are 180 hazelnut crush facties which have 1.800.000 ton capacity and 40 establishments has 350.000 ton capacity. In Turkey, there are over 300.000 hazelnut producer and two million people are engaged in this sector (BEU, 2009). As a result of high support prices, there has been a large expansion of cropping area in these crops, with significant amounts of surplus production and stock accumulation.

In order to organize the hazelnut market in Turkey, most of Turkish goverments have made an intervention for hazelnut market and later have provided support price to producers (Bozoğlu, 1999). Turkish goverment has declared supportive prices for hazelnut and that later its purchase duty has been given by FİSKOBİRLİK (Hazelnut Agriculture Sales Cooperative Union). All establishments aim inevery sector is to maximize profit. There are two ways for reaching to aims. Either profit is maximized for price level or for sale income (Cooper and Kaplan, 1991). There are total cost, fixed and variable cost in hazelnut agriculture as in all agricultural activities. Fixed costs consist of field rent, general administrative expenses and production insurance and variable costs are manuring, pesticiding, caring (pruning, mattocking, etc.), harvest and marketing activities. Total revenue consist of main production linked with productivity multiply its market prices and revenue from gathering secondary production (Kıral *et al.*, 1999).

Hazelnut producers aim to determine the prices for profit at establishments base in market conditions. Because there are restriction in hazelnut production, producer do a maneuver to increase a total revenue by via production value. But, over cause a sudden drop in world supply hazelnut prices and later goverments make a intervention purchase to proportional with world prices. Total revenue taken by farmers and their profit was negative influenced by these situations (DPT, 2000).

Direct Revenue Support (DRS) payments ratio in support budget ratio was %80 in 2004 and %35 in the year 2008. DRS as it is known cancelled in 2009, field

base payments will constitute %27 nearly at supportive budget. These payments will take a %39 ratio. It forecast increase in production in the year 2010 (DPT, 2009).

In this study, main sections are determined as follows: First of all, relationship between demand and price was reviewed, secondly per person income variable was added to demand model and this model was estimated as a log-log forms, thirdly total costs and variable costs models were examined as a logaritmic forms. Forthly prices were at maximum profit levels and how much produce hazelnut production from these prices and price level was found at maximum income. At the end, Markup prices were found by adding 10% profit ratio to overall costs.

MATERIALS AND METHODS

In this study, data with demand model is taken from Turkish Statistical Institute (TURKSTAT), Ministry of Agriculture and Rural Affairs (MARA), State Planning Organization (SPO), Central Bank of the Republic of Turkey (TCMB). In study, hazelnut production, field of planting, product, purchase price, foreign trade numbers, Gross Domestic Production (GDP) of latest 18 years were used. Data with cost and income models were collected by survey method. All establishments' information regarding with hazelnut cost and income were selected (54 establishments) by target sampling methods. These establishments are from intensive hazelnut production provinces. These provinces and establishments numbers are Trabzon (10), Samsun (8), Sakarya (7), Ordu (10), Giresun (10) and Düzce (9). These provinces constitute 87% of hazelnut production of Turkey. Survey applications to establishments and done by face to face communications with establishments. In Turkey, hazelnut prices dimensions and currency will take an attention later intension of hazelnut production provinces are done by communicating with specialist. At the end these frames are selected by target sampling methods and data with hazelnut costs from these establishments are collected.

In this study, establishment and production expenses of hazelnut are brought up. In this phase, the work force and the other expenses, material (fertilizer, medicine and etc.) expenses, interest and management expenses are taken into consideration as variable expenses. During the calculation of interest of expenses of total, half of T.C. Ziraat Bank's one year due date agricultural establishments credit (annually 18% interest rate) is taken into consideration in 2009. Real interest rate (annually %5) is used for the calculation of interest of establishments expenses. At the calculation of correspond to management, technical characteristics of hazelnut raising and conditions of region are taken into consideration. %3 of total of expenses are taken for

calculation of correspond to management (Kıral *et al.*, 1999).

In economic theory, important factors for determination of demand are prices of goods, prices of complementary or rival goods, income level of personal, entertainmant and habits (Parasız, 1998). In this study, establishments are collected by reducing unique establisment approximation and determinations of prices levels are done by fixing the other variables and at this point demand models are examined for changing of hazelnut prices. Market are closed to foreign bazaars or markets.

$$Q_d = f(P) \qquad (1)$$

where, Q is total hazelnut demand quantity and P is hazelnut prices expressed in sympobic forms. Besides, in this study elasticity of demand price and income elasticity are calculated for that reason per person income in demand function is indicated as a I.

$$Q_d = f(P, I) \qquad (2)$$

Income and prices are transformed into 1994 years prices. Solutions are done by logaritmic form, analyzed by SPSS program and used regression method (Zeithaml, 1991). Costs of establishments is C and this indicator is taken by fixed and variable costs. Independence variables C, F_c, V_c indicate respectively total cost, fixed cost and variable cost. In economic theory, There are a linear relationship between quantity of producing goods and total costs (Kotler, 1997). But this general principle in hazelnut agriculture, especially the most recent years hazelnut fields are lessened by goverment policy, is not valid. Variation in total cost is stated as a change in variable costs. That is to say, variable costs are located as a independence variable in models.

$$C_t = (F_c) + (V_c) = a + bDM_t \qquad (3)$$

Income (R) is changed by depending on demand to hazelnut (Q) and prices of production (P). Income may be calculated from prices of every production and quantity of deamnd by multiplying (Yurdakul and Koç, 1995).

$$R = (Q) \times (P) \qquad (4)$$

Profit can be get from income-cost.

$$\pi = R - C \qquad (5)$$

If income is greater than costs (that is R > C), profit will get, if income less than costs (that is R < C), loss will be, if income equal costs (that is R = C), either will not profit or not loss (Lankoski, 2008).

RESULTS AND DISCUSSION

In the first stage, relationship between demand and price were revised. Avaliable data were used and analysis results are taken by SPSS program. While demand is dependent variable and price is independence variable are evaluated in our analysis. According to

getting coefficients from analysis, demand model are made as follows:

$$Q_d = 4{,}286 - 0{,}213\ P_d + U_t$$

Q_d: hazelnut demand

P_d: hazelnut price

U_t: error terms

There are relationships between demand and price that appropriate for economic theory. One unit increase in price, will cause decrease 0.213 unit in demand variable. According to t-statistics for level of significance at 0.01, fixed variable value is not statistical important but price %6.2 surroundings is statistically importance. DW = 2.488 value is not correlation between error terms that is correlation problems is not between this terms. R^2 value indicates that variation at dependent variable is explained at %19.1 ratio by variation at price variable that is independence variable (Gujarati,1992).

In the second phase, as it is known per person income are found by dividing GDP to total population. Per person income variable as a independence variable added to models. year 1994 was taken into consideration as a base year (1994=100) for calculating the income for other years. Demand is made by regress over income and price and this point income elasticity of demand and price elasticity of demand are found. Finally, related model is as follows: $\ln Q_d = 4.497 + 0.000003\ln R_d - 0.17\ln P_d$.

Income elasticity of demand is 0.000003, price elasticity of demand is -0.17. Results in models are parellel with economic theory. Demand to hazelnut is linear with income but reverse ratio to hazelnut price. Merely, income elasticity of hazelnut is quite low. In summary, increase in the consumer income is nearly zero at the effective purchase of hazelnut. When we look at price elasticity, while price increase %1, demand decrease %0.17. T-statistics for level of significance at 0.01 found from regression analysis and depend on come to light importance percentages (for price %25.2 and income %60.6) and each two independent variables at located in model are statistical important. DW = 2.450 value does not indicate that relationship between error terms belong to observations. While t-statistics for each independence variables indicate that importance in model, R^2 value is only found %20.4 but remains %80 ratio indicate that variation at demand is explained by the other variables.

In third stage, cost model was found. Costs are constituted as fixed and variable costs. At hazelnut production, big section of costs are fertilizer, pesticiding, pruning, mattocking, harvesting and etc.. All of the costs details are collected from producers with face to face by survey method. Founded total costs are analysed by SPSS program and at this point coefficients are founded by regression method and cost model is as follows below. With %20 percentage error ratio, variable cost is accepted as independence variable. %88.7 ratio for R^2 value,

variation at total cost is highly explained from variation at variable costs.

$$C_d = 1.466 + 0.813 DM_d$$

C_d: Total cost

DM_d: Variable costs

In the fourth stage, prices are founded at maximum profit level and total hazelnut quantity is determined from this production prices. Profit is basically founded from total income subtract total cost (Erkuş and *et al.*,1995). Calculations are done by logaritmic form.

$$\pi = TR - TC = (PQ) - TC$$

$$Q = 4.286 - 0.213\ P$$

by putting Q in aforementioned equation

$$\pi = P(4.286 - 0.213) - 1.466 - 0.813(4.286 - 0.213P)$$
$$= 4.286P - 0.213P^2 - 1.466 - 3.485 + 0.173P$$
$$= -4.951 + 4.459P - 0.213P^2$$

$$\pi = -0.213P^2 + 4.459P - 4.951 \text{ equation is}$$
founded.

Profit is defined as the difference in total revenue, TR, and total cost, TC. A firm maximizes profit by operating at the point where the distance between the total revenue curve and total cost curve is at its maximum. This point occurs where the slopes of the two functions are equal. The slope of the TR function is marginal revenue, MR, while the slope of the total cost function is marginal costs, MC. Thus a profit maximizing firm will produce that quantity of output at which marginal revenue, MR, equals marginal cost, MC. This rule applies regardless of market structure. The only "special" case is a firm operating in a perfectly competitive market. Such a firm operates where price, P, equals MC.

$$\partial\pi/\partial P = 0$$
$$4.459 - 0.426P = 0$$
$$4.459 = 0.426P$$

P = 10.46. taken antilog of P and 349 TL/ton (1994 prices) is found.

According to the Table 1, comparing to maximize to profit of hazelnut producers and prices received by producer, there are parallel in its situation that is prices payments for farmers are maximize to profit at price level moreover extra than before at most years. Merely, some years for 1995, 2002 and 2003 prices received by producer remain under prices which maximize to profit for producers. The other state is that, producer realized a production higher than production quantity for high level profit.

There are consistency in using models for determination of price level. Prices are similar as of years. Some years prices received by producer is higher than the other. While prices received by producer decrease %6 ratio in 2005 year, price levels for founding values increase %31.5 ratio according to 2005 year. Naturally, depending on structure of model will expect a normal arithmetic increase at this price level and like action at this prices received by producer. In this

Table 1 Founding and matearilizing prices at maximum level, producing total hazelnut quantity from these prices

Years	Founding values		Matearilizing prices	
	Price level (TL/ton)	Necessary production quantity from under consideration (ton)	Prices of farmer's payments (TL/ton)	Producing quantity from under consideration (ton)
1995	655	414.653	618	435.000
1996	115	426.146	113	464.000
1997	209	424.139	270	470.000
1998	360	420.934	494	595.000
1999	551	416.867	737	546.000
2000	834	410.832	1.041	480.000
2001	1.348	399.882	1.336	705.000
2002	2.024	385.492	1.670	620.000
2003	2.541	374.472	1.892	512.000
2004	2.823	368.468	2.502	360.000
2005	3.056	363.515	3.970	483.000
2006	3.354	357.159	3.760	775.000
2007	3.566	352.652	3.790	550.000
2008	4.019	342.994	3.780	801.000

situation, take decisions of goverments related with processing mechanizm of hazelnut market is very important.

In fifth phase, price level at maximum sale income is founded. Total income equal to multiply by production quantity and producing goods prices. While total income at first is indicating a quick increase trend with pile of production quantity, this increase ratio is steadily continue and later zero at certain point. Calculations are done by logaritmic form.

TR= P*Q
$P = (-Q/0.213) + 20.12$
$TR = Q*(-Q/0.213 + 20.12)$
$= -Q^2/0.213 + 20.12Q$

As price at maximum profit level, total income at highest level that is total income curve's slope is at zero which total income derivates to production quantity is made equal to zero.

$\partial R/\partial Q = 0$
$-2Q/0.213 + 20.12 = 0$
$2Q = 4.28$
$Q = 2.142$
$Q = 4.286 - 0.213P$
$2.142 = 4.286 - 0.213P$
$P = 2.144 / 0.213 = 10.06$. We take an antilog for P and this value nearly find 234 TL/ton (1994 prices).

Price level at maximum sale income and materialized values are seen in Table 2. Comparing to price level taken and materialized values by 1994 prices, while establishments are taking 3.780 TL/ton price for materialized values in 2008, price getting from model is only 2.672 TL/ton.

Table 2 Price level for maximum sales income and distribution of realizing values for years

Years	Price level (TL/ton)	Realizing values (TL/ton)
1995	44	618
1996	77	113
1997	139	270
1998	239	494
1999	366	737
2000	555	1.041
2001	896	1.336
2002	1.345	1.670
2003	1.689	1.892
2004	1.877	2.502
2005	2.031	3.970
2006	2.230	3.760
2007	2.370	3.790
2008	2.672	3.780

According to the Table 2, price level reaching at total sale income are founded and compared to materialized values. Prices received by producer are higher materialized than prices at maximum sale income and defined as the first hand selling prices of products which are grown and presented to the markets by producers who engaged in agriculture. Also, prices reaching at maximum sale income are determined by model.

Free markets contrast sharply with controlled markets or regulated markets, in which governments directly or indirectly regulate prices or supplies, which according to free market theory causes markets to be less efficient. Where government intervention exists, the market is a mixed economy. In the marketplace the price of a good or service helps communicate consumer

demand to producers and thus directs the allocation of resources toward consumer, as well as investor, satisfaction. In a free market, price is a result of a plethora of voluntary transactions, rather than political decree as in a controlled market. Through free competition between vendors for the provision of products and services, prices tend to decrease, and quality tends to increase. A free market is not to be confused with a perfect market where individuals have perfect information and there is perfect competition.

In sixth stage, markup prices are founded in this section. Per unit fixed cost is founded by dividing fixed costs to production quantity (Kotler,1997). Costs for one kilo are founded by adding per unit variable cost.

$$C = (V_c) + (F_c /Q)$$
%10 from profit
$$P=(C / 1-10)$$

Table 3 Production quantity, costs and markup prices for years

Years	Production quantity (ton)	Costs (TL/kg)	Markup prices over %10 percentages
1995	435.000	1.23	1.37
1996	464.000	1.31	1.46
1997	470.000	1.33	1.48
1998	595.000	1.68	1.87
1999	546.000	1.54	1.71
2000	480.000	1.36	1.51
2001	705.000	1.99	2.21
2002	620.000	1.75	1.95
2003	512.000	1.45	1.61
2004	360.000	1.02	1.13
2005	483.000	1.50	1.66
2006	775.000	1.87	2.08
2007	550.000	1.50	1.66
2008	801.000	2.26	2.52

Production quantity (ton), costs (TL/kg) and markup prices are given in Table 3. Compare 1995 to 2008 years, production quantity, costs and markup prices have nearly doubled increase in 2008. As you see from Table 2, in 2004, production quantity has the lowest number, but in 2005 production quantity has the increase %34.16 percentage according to the 2004 year. From 2005 onwards, there are slightly increase for production quantity but at this point costs and markup prices for 2005 and 2007 years are the same numbers that is respectively 1.50 (TL/kg) and 1.66.

Conclusıons There are national and international literature resources for price elasticity and income elasticity for hazelnut. Most important studies are as follows:

Akbay, *et al*. "Demand elasticities of food productions in Turkey" in their study, price and income elasticities for selected some fruit and vegetables are calculated. Researchers founded 0.13 for income elasticities for hazelnut and -1.21 for price elasticitity.

Yavuz, *et al*. (2005) "Econometric modeling of Turkey's hazelnut sector: Implications on recent policies" in their study they founded 0.2312 for market price elasticity of hazelnut, 0.9929 for support price elasticity of hazelnut and 0.6733 for production cost elasticity of hazelnut.

Gönenç *et al*. (2006) "Economic assessment of hazelnut production and the importance of supply management approaches in Turkey" in their study, they founded long period supply elasticity as a -0.09.

In this study, model are established by log-log forms and later income elasticity of demand is 0.000003, price elasticity of demand is -0.17 are founded. Results in models are parellel with economic theory. Demand to hazelnut is linear with income but reverse ratio to hazelnut price. Merely, income elasticity of hazelnut is quite low. In summary, increase in the consumer income is very nearly zero at the effective of purchase of hazelnut. When we look at price elasticity, while price increase %1, demand decrease %0.17. Comparing to our analysis and the other studies results are not parellel because we use a different base year and using of model.

The hazelnut policies applied by Turkey, the world's largest producer and exporter, have a major influence upon the world market. The government has given financial independence and administrative autonomy to the Union of Hazelnut Sales Cooperatives. Under the new policy arrangements, hazelnut price and producer income have fallen and the effects of the FİSKOBİRLİK on the domestic market have been limited. However, the reform program is not expected to provide a complete solution to the problems currently affecting the hazelnut market.

Determination factors of demand are known as an economically. While we are founding demand model, market is closed for forign effects and other deteminators and later are researched for effective of price. Effect of price at model is nearly %20 ratio and remains %80 sections comprise the other factors.

Per person income are founded by dividing GDP to total population. At model, per person income and price are independence variables. And later, price and income elasticities are founded. Coefficient of determination for independence variables is %20.4 but remains %80 ratio indicate that variation at demand is explained by the other variables.

According to cost model, variable costs with %20 error ratio are accepted as a independence variable and %88.7 ratio founded for R^2 value stated that variation at total cost is explained by variation of variable costs.

If establishments make an adjustment to produce hazelnut quantity for founding model, serious increases are taken at price levels. In 2008, while necessary of

producing to quantity of produce decrease %133 ratio, founding price to farmers of received payments increase %6.32. Price level to maximize total income is founded and matearilized prices is compared with it. According to taken results from model, farmers of received payments are higher than maximizing prices to farmers income.

Per unit fixed cost is been by dividing fixed costs to production quantity and later for one kilo the costs are founded by adding per unit variable costs. Founded costs plus %10 profit ratio is equal to markup prices. According to markup prices, the least prices in 2004 is 1.13 Turkish Lira and the most prices in 2008 year is 2.52 Turkish Lira. According to producing hazelnut quantity from under consideration prices, in 2008 costs are nearly increasing %50.66 ratio for previous year and markup prices increase %51.81 ratio. Namely, establishments are doing costs for hazelnut quantity and markup prices almost same increase.

In hazelnut market, Turkey is the biggest main producer and exporter country in the world. Comparing to the agricultural productions and hazelnut for Turkey, hazelnut registered higher percentages revenue than the others. Turkey's a aim for hazelnut export revenue to maximize in the world's hazelnut market. Until now, Turkey has subsidy policy for hazelnut that high price subsidy to increase hazelnut production. In the short term, this subsidy policy has shown positive results for farmers' revenue but in the long term, it hasn't positive effect for Turkey's budget policy and export and inside and outside price levels. Time to time, Turkish goverments have tried to reduce and diminish pressures by subsidies purchase. At the end of the subsidy policy belong to Turkish goverments, over production and stocks of hazelnut have steadily increased up to now. In the long term, these unestimated increases for hazelnut have affected the quantity of export and determination of price in Turkey. As a conclusion, how to determine the support price for hazelnut is not only regarding with Turkey but also the producer countries.

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